Rector of the University of Würzburg). One does not leave out of sight in commenting on these omissions the fact that the present book aims to be popular, not encyclopedic. Furthermore: There is scanty reference to recent Mendelian work. And there is altogether too brief notice of the evolutional work of paleontologists: the extraordinary studies of Hyatt are inadequately referred to and there is no mention at all of his pupils, Jackson and Grabau. And while Jaekel's epistasis is summarized, there is no reference to the kindred and earlier neotænia of Boas. In the treatment of the environmental factor there is similar unevenness: for while there is given an excellent and detailed account of Wagner's speculations, there is scanty mention of the distinguished services of Professor J. A. Allen, and his name, by the way, does not occur in the index—but this proves nothing, for the index is sadly defective. In general, however, from the point of view of book-making, one does not find serious defects. Printers' slips are not numerous, but one can find them, if he looks hostilely, as he can in any other book. Thus Perameles—even in these days when ill-spelling commends itself to taxonomists—would hardly recognize itself as Permales on page 280. And here and there careless or inaccurate expressions have not been eliminated in the proof. Thus, it is stated that the lung sacs of birds penetrate "through hair fine holes into all the bones," and that in "many fishes the female may never even see the male at spawning time."

BASHFORD DEAN

*An Introduction to Vegetable Physiology.* By J. REYNOLDS GREEN. Second edition. Pp. xx + 459, 182 figs. in text. Philadelphia, P. Blakiston's Son & Co. $3.00.

The first edition has been favorably known for a number of years and the publication of a second edition aroused the expectations that it might be further improved and brought up to date. However, in the volume before us we find little change from the original imprint. It is indeed to be regarded more as an American reprint than as a second edition in the proper sense of the word. It is noticeable that there is no new preface and that the one printed is word for word the same as the first edition with the exception that the date has been omitted. In fact, throughout the book the plates are almost identical, if not wholly so. The one important difference is that Chapter VIII. of the first edition, entitled "Respiration," has been shifted and amalgamated with Chapter XIX. which deals with the release of energy, the two together constituting Chapter XVIII. of the new edition under the title "Energy of the Plant." This is undoubtedly an improvement and renders the presentation of the nutrition phenomena, already well treated, much more logical and comprehensible. Some smaller changes are to be noted in the alteration of introductory paragraphs to certain chapters and the substitution of the more modern word protein for the older term proteid.

Despite the fact that so little new material has been added, it remains one of the best shorter reading books in physiology that we have in English, particularly in the matter of nutrition physiology, which is treated very much more fully than the growth phenomena. It is perhaps to be regretted that more was not done to amplify the second edition, but if its publication in this country will serve to bring it more to the attention of students here, it will serve a useful purpose.

HERBERT M. RICHARDS

## *SOCIETIES AND ACADEMIES*

### THE CHICAGO ACADEMY OF SCIENCES

THE Chicago Academy of Sciences held its annual meeting on Tuesday evening, January 14, 1908, at the academy's building in Lincoln Park. The report of the secretary showed that the work of the academy had been pushed steadily forward during the year and that much had been accomplished in promoting educational matters of a scientific nature among the schools and citizens of Chicago.

Monthly meetings and Friday evening popular lectures have been maintained by the academy, in addition to a number of lectures by other societies, under the auspices of the academy. The most notable of these lectures

by affiliated societies have been twelve lectures given by the Chicago Medical Society and the Society of Social Hygiene on preventive medicine. The Illinois Audubon Society also held its annual meeting in the spring. The total number of lectures and meetings has been thirty-four, at which the combined attendance was 4,008. The smallest number present was fifty and the largest three hundred, the seating capacity of the lecture hall being two hundred.

The academy has been officially represented at several notable gatherings of scientific men, including the Illinois State Academy of Sciences, the Seventh Zoological Congress, the American Association for the Advancement of Science and the American Association of Museums.

The Entomological Section has held eleven meetings, at which papers of interest have been read and discussed.

The Natural History Survey has published two reports on the fauna of the Chicago Area, Bulletin IV., part II., on the "Trilobita of the Niagaran Limestone," by Dr. Stuart Weller, and Bulletin VI., on the "Birds of Chicago," by Mr. F. M. Woodruff. A special illustrated edition of the bird bulletin was prepared for free distribution among the schools and teachers of Chicago and the opportunity was taken advantage of by a large number of both schools and teachers. The academy has been the recipient of many favorable comments for thus aiding in the study of the local bird fauna.

The curator's report showed that interest in the museum by visitors, schools and students was increasing. The schools have made use of the collections to an unprecedented degree and the exhibit collections have been largely used for the acquisition of general information. Laboratory and study facilities have been provided for those who desired to work at the academy building.

During the year the building has been redecorated throughout, the light oak cases on the main floor have been refinished in weathered oak and the interiors of the cases have been painted a blue-gray color. All museum cases have been installed with glass shelves with inconspicuous supports.

The notable additions to the exhibits have been a collection of economic minerals with distribution maps; a collection of Philippine Land Mollusks from the Quadras collection; a large expansion of the exhibit illustrating the pearl button industry; the expansion of the collection of native birds with their nests and eggs or young and with habitat maps, and an ecological collection of invertebrates, arranged in groups.

The label department showed a total of 8,088 labels produced.

A feature of the academy's work has been the identification of material for institutions and individuals, which amounted to 2,625 specimens, submitted by twelve individuals and institutions.

The accessions for the year aggregated 30,111 specimens, of which 28,547 were in the department of Mollusca.

The annual election of officers for the year 1908 resulted as follows:

*President*—T. C. Chamberlin.

*Vice-presidents*—Charles S. Raddin and Albert L. Stevenson.

*Acting Secretary*—Frank C. Baker.

*Trustees* (five years)—Charles S. Raddin and Charles H. Blatchford.

*Executive Board* (three years)—Stuart Weller and Lester Curtis.

Frank C. Baker,
*Acting Secretary*

## THE BIOLOGICAL SOCIETY OF WASHINGTON

The 438th meeting was held January 25, 1908, President Stejneger in the chair.

The first communication consisted of an "Exhibition of Colored Lantern Slides by the Autochrome Plates," by Professor W. P. Hay. He discussed the process of direct color photography recently perfected by the Lumières, of Lyons, France, in its relation to scientific work and exhibited a number of lantern slides made on the new "Autochrom" plates.

These plates bear a panchromatic film of great delicacy and sensitiveness underlaid by a stratum of starch grains colored orange-red, purplish blue, and green. The granules aver-

age about 1/2,500 of an inch in diameter, are spread out in a single layer in almost perfect contact with each other and are mixed so intimately and in such proportions that light passing through an unobscured plate appears white, or, more strictly speaking, a neutral gray.

For taking a photograph any ordinary camera may be used but a light orange color screen specially adapted to these plates must be fitted to the lens. The plates must be placed in their holders glass side toward the lens, instead of the reverse as in ordinary plates, so that during the exposure any light which reaches the sensitive film must first encounter the layer of starch grains, each grain of which will allow the passage of light of its own color and prevent the passage of light of any other color. Owing to the color screen and the still more retarding effect of the starch grains the plates are exceedingly slow and the exposures are from 75 to 100 times or more as long as would be required by the most rapid plates under the same conditions of light. After exposure the plate is developed in total darkness in a pyrogallic acid developer for about two and a half minutes, rinsed in water, and at once placed in a bath of permanganate of potash and sulphuric acid and carried from the darkroom into full daylight. The permanganate of potash and sulphuric acid mixture rapidly dissolves away the reduced silver in this negative but does not effect the unreduced portion. A second development in daylight, in paramidophenol, or a similar developer working without alkali, results in the reduction of the hitherto unchanged silver salt of the film and produces a positive in which the form and color of the object photographed are accurately reproduced. The colors, however, are generally weak and the plate must be intensified in order to bring them out in full brilliancy. The operations of clearing, fixing, drying and varnishing follow in rapid succession and the transparency is completed. As yet no method of making a colored print on paper has been perfected, but duplicate transparencies may be made by the ordinary methods.

As a means of easily and quickly producing colored photographs of many kinds of natural history objects this new process presents many advantages and in spite of the cost and shortcomings of the plates will doubtless come extensively into use. The exposure required, even under the most favorable conditions and with the most rapid lens, is so long that photographs of moving objects are out of the question. The plates are much less transparent than ordinary plates and when used as lantern slides require a stereopticon equipped with a powerful light and placed comparatively close to the screen. Added to these disadvantages is the much more serious one, that the colors of the starch granules, on which the color of the image depends, are not stable and gradually disappear if long subjected to the intense concentrated light of the oxyhydrogen or electric lantern.

The lantern slides exhibited covered a wide range of subjects, such as microphotographs of rock sections, various mineral and organic crystals with polarized light, direct photographs of the solar spectrum, copies of paintings, views of beetles, butterflies, shells, flowers, etc., and landscapes, demonstrating conclusively that it is now possible to photograph the color as well as the form of any object and fix them for future reference on a plate which, except under the most trying conditions of light, should last indefinitely.

The next communication, from Dr. F. V. Coville, was on "The Probable Assimilation of Free Nitrogen by the Swamp Blueberry (*Vaccinium corymbosum*)." An abstract on this subject will appear later.

The last communication, entitled "Some Problems and Possibilities in Hop Culture" was presented by Dr. W. W. Stockberger in the form of a lecture illustrated by lantern slides showing methods of cultivation, harvesting and curing the crop, and the comparative growth of local and European varieties on American soils.

Attention was directed to the desirability of selecting varieties adapted to the various conditions of soil and climate, to the influence of seasonal distribution of rainfall on growth and quality and to the necessity of a much broader knowledge of the physiological activi-

ties involved in the process of curing. A machine which promises soon to be available for picking the crop was mentioned as a possible solution of the labor question involved in harvesting.

The opportunity for the improvement of quality through selection and breeding was pointed out, the immediate problem therein being the discrimination of varieties which are now almost hopelessly confused. The work of breeding is further hampered by the fact that while more than a hundred varieties of the female form of the hop have been named only *one* variety of male plants is recognized.

M. C. Marsh,
*Recording Secretary*

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 198th meeting of the society, held at the Cosmos Club, on Wednesday evening, January 8, 1908, under informal communications, Mr. E. S. Bastin described a pyrrhotitic peridotite from East Union, Maine. This dike rock is unusual because of the presence in it of nearly 30 per cent. of pyrrhotite so related to fresh olivine and plagioclase grains that it is proved to be an original constituent. The analysis shows the rock to belong to subclass 2 of Class V. It is the first described representative of this subclass and has been named Lermondose. The total percentage of nickel, cobalt, and copper sulphides is about 2 per cent. It furnishes, therefore, an example of an ore of purely igneous origin.

Mr. R. H. Chapman exhibited photographs illustrating an ancient method of ore crushing near Gadug, about 300 miles southeast of Bombay, India. The bedrock with a gradual slope toward a stream has a shallow trench along the higher portion, from which water was fed over the surface, in which more than a hundred saucer-like depressions are located. These holes were used as mortars in which the ore was crushed by stone pestles in the hands of native laborers. Similar forms are known in which the mortars were larger and the crushers were boulders, of one half to one ton weight, which were handled with a framework. It is estimated that this quartz mill was in use about 2,000 years ago.

*Regular Program*

*Centenary of the Geological Society of London:* Mr. Whitman Cross.

*Some Volcanoes of the Western Mediterranean:* Henry S. Washington.

In the summer and fall of 1905 the speaker undertook the investigation of some of the less well-known volcanoes of the western basin of the Mediterranean for the Carnegie Institution of Washington. The volcanoes of Catalonia occupy the site of a Pliocene gulf, and are post-Quaternary. The earlier eruptions formed extensive and often deep lava flows, which partially filled the preexistent and still persistent drainage, and these were followed by the formation of numerous, small, cinder cones. The lavas are feldspar-basalts, nephelite-basalts, and limburgites, of quite uniform chemical characters.

The volcanic rocks of Sardinia are referred to three periods: a series of sheets of basalts and rhyolites, of Tertiary age, which cover extensive areas in western Sardinia; the subsequent large volcanoes of Monte Ferru and Monte Arci, near the west coast; and the numerous, small, recent, cinder cones which extend from near Bonorva to near Sassari. The lavas of Monte Ferru are trachytes and phonolites, which form the core of the deeply dissected volcano, and rather monotonous basalts, which cover the other lavas and extend far over the surrounding country. Similarly, the core of Monte Arci is composed of chemically uniform, though texturally diverse, rhyolites, covered by a mantle of later basalts. The recent cinder cones are wholly basaltic. Their eruption antedated the construction of the prehistoric nuraghi, for which Sardinia is famous.

The island of Pantelleria is wholly volcanic, the earliest eruptions being the trachytes of the dominating, but badly worn, Montagna Grande, with flows of other trachytic rocks. These were followed by flank eruptions of pantellerites, very high in silica and low in alumina, and distinctly sodic. The latest eruptions are basaltic and formed small cinder cones, like those of Catalonia and Sardinia,

while submarine eruptions took place in the neighborhood of Pantelleria in 1831 and 1891. The small and hitherto undescribed island of Linosa, about one square mile in area, contains nine volcanic cones. These are referred to two periods; an earlier one of cones of greenish and yellow tuffs, containing blocks of basalt, and a later one of cinder cones, with lava flows of feldspar-basalt and nephelite-basalt. The Linosa lavas are very uniform in chemical characters.

Many analyses of the rocks have been made, and they are shown to be closely alike in their chemical features, one of the most notable of these being the uniformly high percentage of titanium. All the volcanoes mentioned are considered, therefore, to be genetically related and to belong to the same co-magmatic region or petrographic province, which possibly extends into Africa, as far as the Great Rift Valley. This petrographic province is very different in its characters from those of the Italian peninsula and also from that embracing the volcanoes of the Grecian Archipelago and Asia Minor, which have also been studied by the speaker. The reputed volcano of Boukournine, near Tunis, was visited and was found to be composed entirely of limestone. A brief account was given of the occurrence of orbicular diorite at Santa Lucia di Tallano in Corsica. The paper was illustrated by lantern-slides.

RALPH ARNOLD,
*Secretary*

## DISCUSSION AND CORRESPONDENCE

### THE DISTRIBUTION OF CLOSELY ALLIED SPECIES

THE idea that closely related species do not possess identical geographical distributions is a theoretical deduction which should be rigorously tested by the examination of actual cases. Recently, R. G. Leavitt has done this with reference to plants (chiefly orchids),[1] and arrives at the conclusion that this principle, as expressed by D. S. Jordan,[2] is not well supported.

[1] "The Geographical Distribution of Nearly Related Species," *American Naturalist*, 41, 1907, pp. 207–240.

[2] "Given any species in any region, the nearest related species is not likely to be found in the same region" (SCIENCE, 22, 1905, p. 547).

[3] *Proceedings American Philosophical Society*, 44, 1905, pp. 127, 128.

[4] *American Naturalist*, 41, 1907, p. 654.

[5] "The Crawfishes of the State of Pennsylvania," *Memoirs Carnegie Museum*, 2, 1906, p. 512.

[6] See also SCIENCE, 23, 1906, p. 949.

Nevertheless, I think that Jordan's sentence is fundamentally correct, provided it is changed so as to refer not only to purely geographical, but also to ecological conditions.

I have expressed this idea in two sentences:[3] (1) "Closely allied species occupy neighboring areas"; (2) "More or less closely allied species occupying the same or nearly the same territory, generally possess different habits." Further, I have treated of this subject more especially in a recent publication,[4] classifying the forms of segregation of closely allied species, geographically as well as ecologically.

It will be remarked that, wherever I have talked about this subject, I always have used the word *species*.[5] Leavitt, in the paper referred to (p. 230), deliberately changes the word *species* in Jordan's sentence into *kind*, and investigates the distribution of "pairs of kinds" of plants. This substitution, *kind* or *form* in place of *species*, is also advocated by J. A. Allen.[6]

*This change, however, is entirely inadmissible.* I used the above phrases in connection with the bearing of isolation or segregation upon the formation of species (speciation), and wanted to bring out the idea that geographical or ecological segregation is a criterion by which *species* may be recognized. I intended the word "species" in the strict taxonomic sense, that is to say, for "forms" which are morphologically separated from the allied forms. My object was to express the opinion that the morphological segregation of true species is connected with and due to some kind of segregation in the physical conditions under which the "species" live, and I pointed out that this might be either purely geographical or ecological. *Ecological or geographical segregation is the factor which results in speciation,* that is to say, the factor which